

## AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

### Listing of Claims:

- 1        1. (Currently amended) A method for supporting read-only objects  
2        within an object-addressed memory hierarchy, comprising:  
3                receiving a request at a translator to access an object, wherein the request  
4        includes an object identifier for the object that is used to reference the object  
5        within the object-addressed memory hierarchy, and wherein the translator  
6        converts an object identifier and offset into a corresponding physical address and  
7        converts the request to access an object into a request for the corresponding  
8        physical address;  
9                using the object identifier to retrieve an object table entry associated with  
10      the object; and  
11                if the request is a write request,  
12                        examining a read-only indicator within the object table  
13                        entry, and  
14                                if the read-only indicator specifies that the object is a read-  
15        only object, performing a corrective action to deal with the fact that  
16        the write request is directed to a read-only object, wherein  
17        performing the corrective action can involve:  
18                                obtaining a writable copy of the object,  
19                                clearing the read-only indicator to indicate that the  
20                                object is no longer read-only, and updating the

21                   writable copy of the object with data from the write  
22                   request;  
23                   updating a remotely located master copy of  
24                   the object with data from the write request;  
25                   terminating the requesting process because  
26                   the write request is not allowed; and  
27                   if the request is directed to a debugging  
28                   breakpoint, pausing the requesting process and  
29                   clearing the read-only indicator.

1                 2. (Original) The method of claim 1, wherein if the request is a read  
2                 request, the method further comprises using a physical address from the object  
3                 table entry to access the object in main memory.

1                 3. (Original) The method of claim 1, wherein performing the  
2                 corrective action can involve causing a fault handler in the requesting processor to  
3                 perform the corrective action.

1                 4. (Cancelled)

1                 5. (Cancelled)

1                 6. (Currently amended) The method of claim 1,  
2                 wherein prior to receiving the request at the translator, the request is  
3                 initially directed to ~~the~~an object cache;  
4                 wherein if the request causes a hit in the object cache, the object is  
5                 accessed in the object cache and the request is not sent to the translator; and

6           wherein if the request causes a miss in the object cache, the request is sent  
7 to the translator.

1           7.       (Original) The method of claim 6, further comprising making a  
2 given object read-only by:

3           setting a read-only indicator associated with the given object to indicate  
4 that the given object is read-only;

5           causing all object caches within a local cache-coherent domain to flush any  
6 modified cache lines of the given object out to main memory;

7           whereby subsequent upgrades of the given object from read-only status to  
8 writable or modified status in any caches within the local cache-coherent domain  
9 must go through a translator.

1           8.       (Original) The method of claim 7, wherein causing all object  
2 caches within the local cache-coherent domain to flush any modified cache lines  
3 of the given object out to main memory involves executing a read-with-intent-to-  
4 only-read (RWITOR) instruction on each cache line of the given object.

1           9.       (Original) The method of claim 7, wherein the given object can be  
2 made read-only in response to a request received from outside the local cache-  
3 coherent domain.

1           10.      (Previously presented) The method of claim 1, wherein the  
2 translator includes hardware to translate between object identifiers and physical  
3 addresses.

1           11.      (Currently amended) An apparatus that supports read-only objects  
2 within an object-addressed memory hierarchy, comprising:

3           a receiving mechanism configured to receive a request at a translator to  
4 access an object, wherein the request includes an object identifier for the object  
5 that is used to reference the object within the object-addressed memory hierarchy,  
6 and wherein the translator converts an object identifier and offset into a  
7 corresponding physical address and converts the request to access an object into a  
8 request for the corresponding physical address;

9           a translation mechanism configured to use the object identifier to retrieve  
10 an object table entry associated with the object; and

11           a corrective action mechanism, wherein if the request is a write request,  
12 the corrective action mechanism is configured to,

13                 examine a read-only indicator within the object table entry,  
14                 and

15                 if the read-only indicator specifies that the object is a read-  
16 only object, to perform a corrective action to deal with the fact that  
17 the write request is directed to a read-only object, wherein  
18 performing the corrective action can involve:

19                 obtaining a writable copy of the object,  
20                 clearing the read-only indicator to indicate that the  
21                 object is no longer read-only, and updating the  
22                 writable copy of the object with data from the write  
23                 request;

24                 updating a remotely located master copy of  
25                 the object with data from the write request;

26                 terminating the requesting process because  
27                 the write request is not allowed; and

28                 if the request is directed to a debugging  
29                 breakpoint, pausing the requesting process and  
30                 clearing the read-only indicator.

1           12. (Original) The apparatus of claim 11, wherein if the request is a  
2 read request, the translation mechanism is additionally configured to use a  
3 physical address from the object table entry to access the object in main memory.

1           13. (Original) The apparatus of claim 11, wherein the corrective action  
2 mechanism is configured to cause a fault handler in the requesting processor to  
3 perform the corrective action.

1           14. (Cancelled)

1           15. (Cancelled)

1           16. (Currently amended) The apparatus of claim 11, wherein the  
2 apparatus includes thean object cache;  
3           wherein prior to receiving the request at the translator, the request is  
4 initially directed to the object cache;  
5           wherein if the request causes a hit in the object cache, the object is  
6 accessed in the object cache and the request is not sent to the translator; and  
7           wherein if the request causes a miss in the object cache, the request is sent  
8 to the translator.

1           17. (Original) The apparatus of claim 16, further comprising a read-  
2 only configuration mechanism configured to make a given object read-only by:  
3           setting a read-only indicator associated with the given object to indicate  
4 that the given object is read-only; and  
5           causing all object caches within a local cache-coherent domain to flush  
6 any modified cache lines of the given object out to main memory;

7           whereby subsequent upgrades of the given object from read-only status to  
8       writable or modified status in any caches within the local cache-coherent domain  
9       must go through a translator.

1           18.     (Original) The apparatus of claim 17, wherein the read-only  
2       configuration mechanism causes all object caches within the local cache-coherent  
3       domain to flush any modified cache lines of the given object out to main memory  
4       by executing a read-with-intent-to-only-read (RWITOR) instruction on each cache  
5       line of the given object.

1           19.     (Original) The apparatus of claim 17, wherein the read-only  
2       configuration mechanism makes the given object read-only in response to a  
3       request received from outside the local cache-coherent domain.

1           20.     (Previously presented) The apparatus of claim 11, wherein the  
2       translator includes hardware to translate between object identifiers and physical  
3       addresses.

1           21.     (Currently amended) A computer system that supports read-only  
2       objects within an object-addressed memory hierarchy, comprising:  
3           a processor;  
4           the object-addressed memory hierarchy;  
5           an object cache within the object-addressed memory hierarchy;  
6           a translator that translates between object identifiers, used to address  
7       objects in the object cache, and physical addresses, used to address objects in  
8       main memory;  
9           a receiving mechanism within the translator configured to receive at the  
10      translator a request to access an object, wherein the request includes an object

11 identifier for the object that is used to reference the object within the object-  
12 addressed memory hierarchy, and wherein the translator converts an object  
13 identifier and offset into a corresponding physical address and converts the  
14 request to access an object into a request for the corresponding physical address;  
15       a translation mechanism within the translator configured to use the object  
16 identifier to retrieve an object table entry associated with the object; and  
17       a corrective action mechanism, wherein if the request is a write request,  
18 the corrective action mechanism is configured to,  
19               examine a read-only indicator within the object table entry,  
20               and  
21               if the read-only indicator specifies that the object is a read-  
22 only object, to perform a corrective action to deal with the fact that  
23 the write request is directed to a read-only object, wherein  
24 performing the corrective action can involve:  
25               obtaining a writable copy of the object,  
26               clearing the read-only indicator to indicate that the  
27               object is no longer read-only, and updating the  
28               writable copy of the object with data from the write  
29               request;  
30               updating a remotely located master copy of  
31               the object with data from the write request;  
32               terminating the requesting process because  
33               the write request is not allowed; and  
34               if the request is directed to a debugging  
35               breakpoint, pausing the requesting process and  
36               clearing the read-only indicator.